Speed Recording

variation. Any heading other than that which is perpendicular to the direction of the two beams will result in flying a longer course than that for which the speed is computed. Computed speeds will be lower than actual speed, and will vary with heading as follows:—

HEADING VARIATION	ERROR IN COMPUTED SPEED
1 deg	0.015 per cent
2 deg	0.061 per cent
3 deg	0.137 per cent
4 deg	0.244 per cent
5 deg	0.381 per cent

Distance between the two beams has been determined by a Coast and Geodetic survey which is accurate to one part in one million. Because of curvature of the earth, the two beams are not parallel, but spread apart slightly as a function of altitude and beam separation. On the basis of a 10-mile beam separation, this spread with altitude amounts to 151ft at a height of 60,000ft. The beams are aligned and maintained to within ±50ft at a distance of 12.5 miles from the transmitter. On the basis of a course-run of 10 miles, and both beams off the maximum amount in opposite directions, this error amounts to 0.190 per cent. The error introduced by chronograph timing is ±0.008 second. On the basis of a speed of 600 m.p.h. and a course-run of 10 miles, this error is 0.0133 per cent, which is negligible. Using maximum errors that can be reasonably assumed, such as 3 deg variation in heading, beam alignment in error by 100ft (two beams off in opposite directions) and a 0.008 second timing error, the maximum error on a basis of 600 m.p.h. and a run of 10 miles is 0.34 per cent. The probable error is less.

The all-altitude speed course is now in operation in the vicinity of Wright Field, and a second installation is scheduled for Muroc Army Airfield, California. These facilities are to be available to all branches of the armed services as well as institution activities, such as the N.A.C.A.

THE NORD 1700 NORELIC

French Helicopter with Unusual Features

THE S.N.C.A. du Nord, in common with other sections of the French nationalized aircraft industry, has a number of interesting aircraft in project and prototype stages. The concern has recently completed a helicopter known as the Nord 1700 Norelic, which is at present undergoing flight tests. The first flight of the Norelic was made on November 17th at Issy-les-Moulineaux, and the helicopter is of single two-bladed main rotor configuration, with a small auxiliary rotor. An unusual feature of the design is that it incorporates a pusher propeller running in a guide cowling or shroud. This feature, in addition to providing some forward propulsion, is claimed to counteract torque reaction by means of its airflow effect on a series of large tail fins or vanes attached to the shroud. The shroud eliminates the risk of injuries sustained by persons inadvertently walking into the rotating propeller. Construction is of all-metal monocoque type, and the Norelic provides side-by-side seating for two persons.

The research prototype of the Norelic helicopter.

The first prototype, depicted in the accompanying photograph, is intended primarily for research purposes in determining the features desirable for the subsequent production model. The cockpit enclosure of the prototype will eventually be replaced by one of cleaner design, and somewhat reminiscent of that of the Bell Model 47; and the complicated rotor head will be enclosed in a neat fairing.

The manufacturers claim that in the event of an engine failure, and the subsequent disconnection of the power transmission, the Norelic offers a considerably lower sinking speed than many contemporary types. The estimated performance of the Norelic when powered by a Mathis G7R engine developing 160 h.p. at 3,100 r.p.m. is: Maximum speed, 115 m.p.h.; cruising speed at 75 per cent power, 96.3 m.p.h.; maximum rate of climb, 1,056 ft/min; range, 248.6 miles; maximum hovering ceiling, 5,000ft; maximum ceiling, 9,842ft.

AMERICAN AIRCRAFT GAS TURBINES

IT is frequently stated that this country is well ahead of all others, including the United States, in the development and production of aircraft gas turbines. We believe this to be true, and facts recently published in America, the only country which offers important competition in this field, seem to confirm the statement.

In a recent review of the gas turbine position in America, our contemporary, *Aviation Week*, points out that the two major producers of military engines for World War II are not turning out jet engines for service. These companies, the Pratt and Whitney Aircraft Division of United Aircraft Corp. and Wright Aeronautical subsidiary of Curtiss Wright Corp., were not in on the early development of jet engines because all of their engineering and manufacturing facilities were devoted to piston engines. It seems that they are now spending about 30,000,000 dollars in an effort to catch up on jet development. The only company which now have jet engines in quantity production is the Allison Division of General Motors Corp., and their production engines were originally developed by the General Electric Company, a non-aviation concern.

About this time last year Pratt and Whitney began tooling up for the production of the Rolls-Royce Nene, following a remarkably successful passing of the U.S. Navy's 150-hour type test by one of these units. An important new Navy fighter, the Grumman XF9F-2, is now flying with a single Nene for power. Reports on the behaviour of Nenes in America during the last year have been excellent.

A word on definitions is also contained in *Aviation Week* suggesting that in addition to the family name of "gas turbine" the three more common varieties should be called "turbojet," "turboprop" and "turboramjet." A turboramjet is a turbojet with after-burning.

Manufacturer	Model	Type	Compressor Stages	Turbine Stages	Thrust lb S.L. static	s.h.p.	r.p.m.	Spec. fuel consumpt. lb/hr/lb thrust	Overall length (in)	Overall diam. (in)	Weight lb
Allison Div. of General Motors	J-22-A-33	C	1	1	4,600	—	11,750	1.12*	103	50.5	1,735
	J-35-A-15	A	11	1	3,750	—	7,700	1.075*	145	37.5	2,425
General Electric	T-31-GE-3 (TG-100B)	AP	14	1	500	1,900	13,000	0.768	114.5	35	1,984
Westinghouse Electric	J-30 (19XB-2B)	A	10	1	1,600	—	17,000	1.15	94	19	718

* At Cruising power